Impacts of invasive drills on Olympia oysters in Puget Sound: patterns and mechanisms

Eric Buhle, University of Washington*

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Invasive species contribute to estuarine biodiversity loss by directly causing population declines in native species or by preventing their recovery from other anthropogenic stressors. We are investigating the impact of the invasive Japanese oyster drill (*Ocinebrellus inornatus*) on the Olympia oyster (*Ostreola conchaphila*), which has remained scarce in Puget Sound/Georgia Basin following historical overexploitation and pulp mill pollution. We measured drill predation rates by transplanting Olympia oysters into five sites in Puget Sound. Drill predation represented up to 100% of total mortalities over four months, but was highly variable and weakly related to drill densities within and among sites. The per capita effect of drills diminished with increasing density of naturally occurring oysters, suggesting that some of the spatial variation in impact is due to saturation in drill feeding rates when prey are abundant. Enclosure experiments in which drill and oyster densities were manipulated indicated that drills have a saturating functional response, consistent with this hypothesis. Based on our results, drills may threaten native oyster recovery in some areas, but restoration may be possible without completely eradicating drills if oyster abundance and recruitment are sufficient to saturate drill feeding rates.